Agency for Healthcare Research and Quality
Advancing Excellence in Health Care

NATIONAL GUIDELINE CLEARINGHOUSE

General

Guideline Title

ACR Appropriateness Criteria® chronic chest pain — low to intermediate probability of coronary artery disease.

Bibliographic Source(s)

Woodard PK, White RD, Abbara S, Araoz PA, Cury RC, Dorbala S, Earls JP, Hoffmann U, Hsu JY, Jacobs JE, Javidan-Nejad C, Krishnamurthy R, Mammen L, Martin ET, Ryan T, Shah AB, Steiner RM, Vogel-Claussen J, White CS, Expert Panel on Cardiac Imaging. ACR Appropriateness CriteriaÂ® chronic chest pain - low to intermediate probability of coronary artery disease. [online publication]. Reston (VA): American College of Radiology (ACR); 2012. 6 p. [37 references]

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: Woodard PK, Yucel EK, Khan A, Atalay MK, Haramati LB, Ho VB, Mammen L, Rozenshtein A, Rybicki FJ, Schoepf UJ, Stanford W, Stein B, Jaff M, Expert Panel on Cardiac Imaging. ACR Appropriateness Criteria® chronic chest pain--low to intermediate probability of coronary artery disease. [online publication]. Reston (VA): American College of Radiology (ACR); 2008. 5 p. [24 references]

Recommendations

Major Recommendations

ACR Appropriateness Criteria®

Clinical Condition: Chronic Chest Pain -- Low to Intermediate Probability of Coronary Artery Disease

Radiologic Procedure	Rating	Comments	RRL*
X-ray chest	9		☢
US echocardiography transthoracic stress	8	To exclude ischemic cardiac disease.	O
SPECT MPI rest and stress	8	To exclude ischemic cardiac disease.	☢☢☢☢
CTA chest (noncoronary) with contrast	8	For pulmonary embolism and thoracic aortic aneurysm/dissection. To rule out pulmonary embolism and evaluate lung pathology.	☢☢☢
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate ...onary atherosclerosis, anomalous coronary artery, and pericardial disease.			*Relative Radiation Level

Radiologic Procedure	Rating	Comments	RRL*
		High negative predictive value will exclude coronary artery disease and allow triage management to focus on more likely diagnoses. To eliminate unnecessary catheterizations.	
MRI heart with stress without and with contrast	8	Can be used in patients with poor echocardiography window, or indeterminate stress test. See statement regarding contrast in text under "Anticipated Exceptions."	O
CTA coronary arteries with contrast with advanced low dose techniques	8	Especially useful in younger patients in whom anomalous coronary artery is being considered.	☢☢☢
Rb-82 PET heart stress	8	N-13 ammonia may be used if a cyclotron is available.	☢☢☢
MRI heart with stress without contrast	6	Dobutamine MRI heart stress test might be used in patients with poor echocardiography window or indeterminate stress test. Useful when MRI is desired, but renal insufficiency precludes use of gadolinium-based MRI contrast agents. Availability limited to centers with expertise.	O
X-ray barium swallow and upper GI series	6	If gastroesophageal reflux, esophagitis, achalasia, or esophageal tumor is considered a likely source of chest pain, then indication is higher.	☢☢☢
US echocardiography transthoracic resting	6	Can be used to assess for valve disease or pericardial disease as a cause for chronic chest pain.	O
US abdomen	6	If referred chest pain is thought to be caused by cholecystitis, stones, or biliary disease.	O
CT chest without contrast	6		☢☢☢
Coronary angiography with ventriculography	6	If ischemic cardiac disease remains in the differential.	☢☢☢
MRI heart function and morphology without and with contrast	4	For determination of constrictive pericarditis. See statement regarding contrast in text under "Anticipated Exceptions."	O
US echocardiography transesophageal	4	If TTE is inadequate and there is no suspicion of esophageal disease.	O
Tc-99m V/Q scan lung	4	May be used in patients with suspected chronic pulmonary embolism in patients with iodinated contrast contraindications.	☢☢☢
Tc-99m 3-phase bone scan area of interest	4		☢☢☢
Arteriography pulmonary	4	If CT or V/Q scan imaging is inadequate and chronic pulmonary embolism is the principal suspected etiology, or if concurrent pulmonary arterial pressures are to be obtained.	☢☢☢☢
MRI heart function and morphology without contrast	3	For determination of constrictive pericarditis. If contrast cannot be given.	O
MRI chest without and with contrast	3	Possibly for chronic pulmonary embolism in patients unable to undergo chest CTA.	O
CT coronary calcium	3	May be used in patient risk stratification. Zero score alone cannot be used to exclude ischemia.	☢☢☢
MRI chest without contrast	2	For noncardiac etiologies, including pleural disease.	O
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the table are listed at the end of the "Major Recommendations" field.

<u>Summary of Literature Review</u>

Chronic chest pain can arise from a variety of etiologies. However, of those potential causes, the most threatening arise from cardiac disease. Chronic noncardiac chest pain (nCCP) is most commonly related to gastroesophageal reflux disease (GERD) or other esophageal diseases. Alternatively, it may be related to costochondritis, arthritic or degenerative diseases, old trauma, primary or metastatic tumors, or pleural disease. Rarely, nCCP may be referred pain from organ systems below the diaphragm, such as the gallbladder.

Nevertheless, cardiac disease must be a primary consideration during the evaluation of chronic chest pain. Chronic cardiac chest pain (CCP) may be caused by either atherosclerotic coronary artery disease (CAD) or other cardiac-related etiologies. The latter include ischemic syndromes in the absence of epicardial CAD as well as nonischemic cardiac pain. Some causes of non-CAD-related ischemia include aortic stenosis, hypertrophic cardiomyopathy, uncontrolled hypertension, interarterial anomalous coronary artery, and syndrome X. Non-ischemic etiologies of chronic CCP are most commonly related to the pericardium and include chronic pericarditis or primary or metastatic tumors.

In evaluating the patient presenting with chronic chest pain, the clinician must first determine the clinical probability of CAD, defined as the likelihood of having a >50% coronary stenosis. This is done by judging whether the chest pain is typical angina, atypical angina, or "noncardiac" and comparing it with the patient's age and gender according to previously reported findings. Typical angina is characterized by substernal chest pain or discomfort that is provoked by exertion or emotional stress and relieved by rest or nitroglycerin. However, a history of atypical angina (chest pain or discomfort that lacks one of the characteristics of typical angina) may be also given.

In order to estimate the patient's probability of CAD, a history and physical examination, including laboratory tests for diabetes and hyperlipidemia and a resting electrocardiogram, are of value. Patients whose age, gender, and type of chest pain indicate a high to intermediate probability of CAD should undergo a stress physiology assessment, either an exercise treadmill, a stress nuclear medicine myocardial perfusion imaging examination, or a stress echocardiography for contractility assessment. If any of these are positive in a patient with symptoms indicating a high probability of CAD, coronary catheterization angiography (CCA) should be considered. In some cases, however, a patient with stable angina may be treated medically.

In a patient with intermediate probability of CAD and positive stress imaging, multidetector coronary computed tomography angiography (CCTA) or CCA can be performed for direct coronary artery evaluation. In patients unable to either exercise or receive pharmacologic stress agents, CCTA may be performed in lieu of a stress imaging examination. Those patients with a low probability of CAD and those in whom CAD has been excluded should be further evaluated for an alternative cause of their chest pain. A screening chest radiograph may be used to further narrow potential etiologies in these low-risk patients.

Guidelines exist in the literature for diagnosing chronic stable angina (ischemia-related chest pain), yet, there are no significant literature presentations of diagnostic algorithms that consider patients with chronic chest pain of determined non-ischemic etiology. There are procedure-related reports that include such patients, but no randomized, controlled trial to provide an evidence-based practice is available. When to order a chest radiograph, chest computed tomography (CT), barium swallow, bone scan, or virtually any diagnostic imaging in patients with chronic nCCP is poorly documented. As a result, the ordering of diagnostic tests is governed by the impression of the primary physician.

Approach to Patients with Chronic Chest Pain

In general, chronic chest pain is defined as chest discomfort that does not change over a period of time; it may wax and wane, but the intensity and duration generally show little change. For this reason, acute coronary syndrome (ACS), myocardial infarction (MI), and aortic dissection are not considered in the differential.

However, findings of chronic chest pain may represent underlying CAD. A great many patients present with what has been characterized as "atypical chest pain." Moreover, 1-year mortality among patients with nonspecific or atypical chest pain has been shown to be higher than for control subjects. For this reason evaluation for CAD should be undertaken in patients with chronic chest pain in the setting of intermediate to high pretest probability of CAD. The principal imaging test used is stress single-photon emission computed tomography myocardial perfusion imaging (SPECT MPI). The intervention performed with a SPECT MPI scan is either exercise- or pharmacologically-induced to invoke perfusion or contraction abnormalities.

Overall, stress echocardiography is competitive with SPECT MPI. When echocardiography is performed, stress contraction abnormalities are induced by either exercise or inotropic stimulation (i.e., dobutamine). In any situation where a SPECT MPI study could be performed, an exercise-stress or dobutamine-stress echocardiogram may be substituted. In certain cases, if aortic valvular stenosis is considered the cause of ischemia or if a pericardial effusion is in question, an echocardiogram at rest may be the preferred examination.

Dobutamine stress functional cardiac magnetic resonance imaging (MRI) may also play a role in the assessment of chronic CCP. This is especially true when the echocardiographic examination is nondiagnostic. In settings where the study may be adequately monitored, dobutamine stress

functional cardiac MRI provides high sensitivity and specificity for ischemia by the induction of wall motion abnormality. However, adenosine stress cardiac MRI perfusion imaging is easier to perform and also has been shown to have relatively high sensitivity and specificity for the presence of CAD. Positron emission tomography/computed tomography (PET/CT) may play a role similar to cardiac MRI in assessing patients with chronic indeterminate chest pain and at low to intermediate risk for CAD. Cardiac PET/CT has been shown to provide incremental prognostic value to historical and clinical variables, and may be of particular use in patients with equivocal or sub-optimal SPECT-MPI or echocardiographic results.

As described above, it should be noted that chronic CCP can occur in ischemic syndromes in the absence of epicardial CAD. The diagnosis of syndrome X, in particular, has been shown to best be made with adenosine stress perfusion cardiac MRI, which demonstrates diffuse subendocardial hypoperfusion. Its utility in comparison to SPECT MPI may be because of its higher spatial resolution. Cardiac MRI without pharmacologic stress could also be performed if valve disease, pericardial disease, or tumor is thought to be the cause of the CCP, especially if the echocardiogram is inadequate.

Most recently coronary 64-slice CCTA has been used to assess both acute and chronic CCP. Like stress SPECT MPI or echocardiography, it can also be used to assess patients with intermediate to high probability of CAD. However, it is especially useful, and used instead of SPECT MPI or echocardiography in patients with atypical chest pain and/or low to intermediate probability of CAD, where etiologies other than CAD are also in question. It has particular utility for noninvasively and accurately demonstrating the origin and course of anomalous coronary arteries. It may also be used in cases where the SPECT MPI or echocardiography examinations were nondiagnostic or the results were questionable.

Recent advances in cardiac CT imaging technology allow for further reduction of the radiation dose from CCTA; available new dose-reducing techniques include prospective triggering, adaptive statistical iterative reconstruction, and high-pitch spiral acquisition. These new lower dose techniques are the appropriate choice in properly selected patients who have a low heart rate (<65 beats per minute [bpm]) and are in sinus rhythm.

Coronary calcium scoring (CCS) is most commonly used for risk stratification in asymptomatic patients. A large study of 10,377 subjects showed that CCS provides independent incremental information in addition to traditional risk factors in the prediction of all-cause mortality. While a patient's calcium score provides independent information regarding a patient's baseline probability of the presence of CAD, a high calcium score cannot be used as strong evidence of myocardial ischemia and a zero calcium score cannot exclude it.

Cardiac catheterization may be used if less invasive imaging was consistent with the presence of significant CAD.

Approach to Patients with Chronic Chest Pain of Determined Noncardiac Etiology

In attempting to stratify the diagnostic tests, a chest radiograph would almost certainly be indicated to exclude bony pathology or chest masses. As GERD is the most common cause of nCCP (found in almost 60% of cases), a barium swallow could be performed or, alternatively, esophageal pH monitoring, manometry, or endoscopy. The remainder of the diagnostic imaging progression depends strongly on the clinical history and signs and symptoms of the patient. For instance, studies performed could include a chest CT scan (if CCTA was not already obtained) to exclude chest syndrome in a sickle cell patient or a lung mass in a patient with chest pain, cough, and weight loss. A right upper quadrant ultrasound might be obtained in a patient with suspected gallstones or chronic cholecystitis. A bone scan could be obtained in someone with a primary malignancy and pain upon rib palpation.

Chronic pulmonary emboli can also cause chest discomfort, and in these patients a contrast-enhanced pulmonary CT angiogram may be performed. A ventilation-perfusion scan may be performed as an alternative in patients with iodinated contrast contraindications. An invasive pulmonary angiogram is a second alternative, especially if the pulmonary CT angiogram is inadequate or pulmonary arterial pressure measurements are required.

Summary

- Whether or not the chest pain is anginal should be initially determined.
- Patient's risk factors for CAD should be determined.
- If a patient is at high risk for atherosclerotic CAD and/or chest pain is determined to be anginal, chronic ischemia should be excluded by stress forms of SPECT or echocardiography, or the presence of flow-limiting CAD can be determined by CCTA. CCTA may be particularly useful in patients with atypical chest pain in whom other etiologies are being considered.
- In patients with low to intermediate probability for CAD and for whom the chest pain is determined by either history or imaging to be nonanginal, further testing depends on the clinical history, signs, and symptoms. Imaging may include assessment for cardiac disease of noncoronary origin, including valvular or pericardial disease.
- GERD is the most common cause of nCCP. If it is suspected, a barium swallow, esophageal pH monitoring, manometry, or endoscopy could be ordered.

Anticipated Exceptions

Nephrogenic systemic fibrosis (NSF) is a disorder with a scleroderma-like presentation and a spectrum of manifestations that can range from limited clinical sequelae to fatality. It appears to be related to both underlying severe renal dysfunction and the administration of gadolinium-based contrast agents. It has occurred primarily in patients on dialysis, rarely in patients with very limited glomerular filtration rate (GFR) (i.e., <30 mL/min/1.73 m^2), and almost never in other patients. There is growing literature regarding NSF. Although some controversy and lack of clarity remain, there is a consensus that it is advisable to avoid all gadolinium-based contrast agents in dialysis-dependent patients unless the possible benefits clearly outweigh the risk, and to limit the type and amount in patients with estimated GFR rates <30 mL/min/1.73 m^2. For more information, please see the American College of Radiology (ACR) Manual on Contrast Media (see the "Availability of Companion Documents" field).

Abbreviations

- CT, computed tomography
- CTA, computed tomography angiography
- GI, gastrointestinal
- MRI, magnetic resonance imaging
- PET, positron emission tomography
- Rb, rubidium
- SPECT MPI, single-photon-emission computed tomography myocardial perfusion imaging
- Tc, technetium
- TTE, transthoracic echocardiography
- US, ultrasound
- V/Q, ventilation/perfusion

Relative Radiation Level Designations

Relative Radiation Level*	Adult Effective Dose Estimate Range	Pediatric Effective Dose Estimate Range
O	0 mSv	0 mSv
☢	<0.1 mSv	<0.03 mSv
☢☢	0.1-1 mSv	0.03-0.3 mSv
☢☢☢	1-10 mSv	0.3-3 mSv
☢☢☢☢	10-30 mSv	3-10 mSv
☢☢☢☢☢	30-100 mSv	10-30 mSv

*RRL assignments for some of the examinations cannot be made, because the actual patient doses in these procedures vary as a function of a number of factors (e.g., region of the body exposed to ionizing radiation, the imaging guidance that is used). The RRLs for these examinations are designated as "Varies."

Clinical Algorithm(s)

Algorithms were not developed from criteria guidelines.

Scope

Disease/Condition(s)

Chronic chest pain

Guideline Category

Diagnosis

Evaluation

Risk Assessment

Clinical Specialty

Cardiology

Emergency Medicine

Family Practice

Gastroenterology

Internal Medicine

Nuclear Medicine

Pulmonary Medicine

Radiology

Intended Users

Health Plans

Hospitals

Managed Care Organizations

Physicians

Utilization Management

Guideline Objective(s)

To evaluate the appropriateness of initial radiologic examinations for chronic chest pain with low to intermediate probability of coronary artery disease

Target Population

Patients with chronic chest pain with low to intermediate probability of coronary artery disease

Interventions and Practices Considered

Diagnosis/Evaluation

1. X-ray
   - Chest
   - Barium swallow and upper gastrointestinal (GI) series
2. Ultrasound (US)
   - Echocardiography transthoracic, stress
   - Echocardiography transthoracic resting
   - Echocardiography transesophageal

- Abdomen
3. Computed tomography (CT)
    - Chest without contrast
    - Coronary calcium
4. CT angiography (CTA)
    - Chest (noncoronary) with contrast
    - Coronary arteries with contrast
    - With contrast with advanced low dose techniques
5. Magnetic resonance imaging (MRI)
    - Heart with stress with or without contrast
    - Heart function and morphology with and without contrast
    - Chest with or without contrast
6. Single photon emission computed tomography myocardial perfusion imaging (SPECT MPI) rest and stress
7. Rubidium (Rb)-82 positron emission tomography (PET) heart stress
8. Technetium (Tc)-99m ventilation/perfusion (V/Q) scan lung
9. Tc-99m 3-phase bone scan area of interest
10. Coronary angiography with ventriculography
11. Pulmonary arteriography

Major Outcomes Considered

Utility of radiologic examinations in differential diagnosis

Methodology

Methods Used to Collect/Select the Evidence

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

Literature Search Procedure

The Medline literature search is based on keywords provided by the topic author. The two general classes of keywords are those related to the condition (e.g., ankle pain, fever) and those that describe the diagnostic or therapeutic intervention of interest (e.g., mammography, MRI).

The search terms and parameters are manipulated to produce the most relevant, current evidence to address the American College of Radiology Appropriateness Criteria (ACR AC) topic being reviewed or developed. Combining the clinical conditions and diagnostic modalities or therapeutic procedures narrows the search to be relevant to the topic. Exploding the term "diagnostic imaging" captures relevant results for diagnostic topics.

The following criteria/limits are used in the searches.

1. Articles that have abstracts available and are concerned with humans.
2. Restrict the search to the year prior to the last topic update or in some cases the author of the topic may specify which year range to use in the search. For new topics, the year range is restricted to the last 5 years unless the topic author provides other instructions.
3. May restrict the search to Adults only or Pediatrics only.
4. Articles consisting of only summaries or case reports are often excluded from final results.

The search strategy may be revised to improve the output as needed.

Number of Source Documents

The total number of source documents identified as the result of the literature search is not known.

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Strength of Evidence Key

Category 1 - The conclusions of the study are valid and strongly supported by study design, analysis and results.

Category 2 - The conclusions of the study are likely valid, but study design does not permit certainty.

Category 3 - The conclusions of the study may be valid but the evidence supporting the conclusions is inconclusive or equivocal.

Category 4 - The conclusions of the study may not be valid because the evidence may not be reliable given the study design or analysis.

Methods Used to Analyze the Evidence

Review of Published Meta-Analyses

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

The topic author drafts or revises the narrative text summarizing the evidence found in the literature. American College of Radiology (ACR) staff draft an evidence table based on the analysis of the selected literature. These tables rate the strength of the evidence for all articles included in the narrative text.

The expert panel reviews the narrative text, evidence table, and the supporting literature for each of the topic-variant combinations and assigns an appropriateness rating for each procedure listed in the table. Each individual panel member forms his/her own opinion based on his/her interpretation of the available evidence.

More information about the evidence table development process can be found in the ACR Appropriateness Criteria® Evidence Table Development document (see the "Availability of Companion Documents" field).

Methods Used to Formulate the Recommendations

Expert Consensus (Delphi)

Description of Methods Used to Formulate the Recommendations

Modified Delphi Technique

The appropriateness ratings for each of the procedures included in the Appropriateness Criteria topics are determined using a modified Delphi methodology. A series of surveys are conducted to elicit each panelist's expert interpretation of the evidence, based on the available data, regarding the appropriateness of an imaging or therapeutic procedure for a specific clinical scenario. American College of Radiology (ACR) staff distributes surveys to the panelists along with the evidence table and narrative. Each panelist interprets the available evidence and rates each procedure. The surveys are completed by panelists without consulting other panelists. The ratings are a scale between 1 and 9, which is further divided into three categories: 1, 2, or 3 is defined as "usually not appropriate"; 4, 5, or 6 is defined as "may be appropriate"; and 7, 8, or 9 is defined as "usually appropriate." Each panel member assigns one rating for each procedure per survey round. The surveys are collected and the results are tabulated, de-identified and redistributed after each round. A maximum of three rounds are conducted. The modified Delphi technique enables each panelist to express individual interpretations of the evidence and his or her expert opinion without excessive bias from fellow panelists

in a simple, standardized and economical process.

Consensus among the panel members must be achieved to determine the final rating for each procedure. Consensus is defined as eighty percent (80%) agreement within a rating category. The final rating is determined by the median of all the ratings once consensus has been reached. Up to three rating rounds are conducted to achieve consensus.

If consensus is not reached, the panel is convened by conference call. The strengths and weaknesses of each imaging procedure that has not reached consensus are discussed and a final rating is proposed. If the panelists on the call agree, the rating is accepted as the panel's consensus. The document is circulated to all the panelists to make the final determination. If consensus cannot be reached on the call or when the document is circulated, "No consensus" appears in the rating column and the reasons for this decision are added to the comment sections.

Rating Scheme for the Strength of the Recommendations

Not applicable

Cost Analysis

The guideline developers reviewed published cost analyses.

Method of Guideline Validation

Internal Peer Review

Description of Method of Guideline Validation

Criteria developed by the Expert Panels are reviewed by the American College of Radiology (ACR) Committee on Appropriateness Criteria.

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The recommendations are based on analysis of the current literature and expert panel consensus.

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

Selection of appropriate radiologic procedures for evaluation and diagnosis of chronic chest pain in patients with low to intermediate probability of coronary artery disease

Potential Harms

Relative Radiation Level (RRL)

Potential adverse health effects associated with radiation exposure are an important factor to consider when selecting the appropriate imaging procedure. Because there is a wide range of radiation exposures associated with different diagnostic procedures, a relative radiation level indication (RRL) has been included for each imaging examination. The RRLs are based on effective dose, which is a radiation dose quantity that is used to estimate population total radiation risk associated with an imaging procedure. Patients in the pediatric age group are at inherently higher risk from exposure, both because of organ sensitivity and longer life expectancy (relevant to the long latency that appears to accompany radiation

exposure). For these reasons, the RRL dose estimate ranges for pediatric examinations are lower as compared to those specified for adults. Additional information regarding radiation dose assessment for imaging examinations can be found in the American College of Radiology (ACR) Appropriateness Criteria® Radiation Dose Assessment Introduction document (see the "Availability of Companion Documents" field).

Gadolinium-based Contrast Agents

Nephrogenic systemic fibrosis (NSF) is a disorder with a scleroderma-like presentation and a spectrum of manifestations that can range from limited clinical sequelae to fatality. It appears to be related to both underlying severe renal dysfunction and the administration of gadolinium-based contrast agents. It has occurred primarily in patients on dialysis, rarely in patients with very limited glomerular filtration rate (GFR) (i.e., <30 mL/min/1.73 m^2), and almost never in other patients. Although some controversy and lack of clarity remain, there is a consensus that it is advisable to avoid all gadolinium-based contrast agents in dialysis-dependent patients unless the possible benefits clearly outweigh the risk, and to limit the type and amount in patients with estimated GFR rates <30 mL/min/1.73 m^2. For more information, please see the ACR Manual on Contrast Media (see the "Availability of Companion Documents" field).

Qualifying Statements

Qualifying Statements

An American College of Radiology (ACR) Committee on Appropriateness Criteria and its expert panels have developed criteria for determining appropriate imaging examinations for diagnosis and treatment of specified medical condition(s). These criteria are intended to guide radiologists, radiation oncologists, and referring physicians in making decisions regarding radiologic imaging and treatment. Generally, the complexity and severity of a patient's clinical condition should dictate the selection of appropriate imaging procedures or treatments. Only those examinations generally used for evaluation of the patient's condition are ranked. Other imaging studies necessary to evaluate other co-existent diseases or other medical consequences of this condition are not considered in this document. The availability of equipment or personnel may influence the selection of appropriate imaging procedures or treatments. Imaging techniques classified as investigational by the U.S. Food and Drug Administration (FDA) have not been considered in developing these criteria; however, study of new equipment and applications should be encouraged. The ultimate decision regarding the appropriateness of any specific radiologic examination or treatment must be made by the referring physician and radiologist in light of all the circumstances presented in an individual examination.

Implementation of the Guideline

Description of Implementation Strategy

An implementation strategy was not provided.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Living with Illness

IOM Domain

Effectiveness

Identifying Information and Availability

Bibliographic Source(s)

Woodard PK, White RD, Abbara S, Araoz PA, Cury RC, Dorbala S, Earls JP, Hoffmann U, Hsu JY, Jacobs JE, Javidan-Nejad C, Krishnamurthy R, Mammen L, Martin ET, Ryan T, Shah AB, Steiner RM, Vogel-Claussen J, White CS, Expert Panel on Cardiac Imaging. ACR Appropriateness Criteria® chronic chest pain - low to intermediate probability of coronary artery disease. [online publication]. Reston (VA): American College of Radiology (ACR); 2012. 6 p. [37 references]

Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

1998 (revised 2012)

Guideline Developer(s)

American College of Radiology - Medical Specialty Society

Source(s) of Funding

The American College of Radiology (ACR) provided the funding and the resources for these ACR Appropriateness Criteria®.

Guideline Committee

Committee on Appropriateness Criteria, Expert Panel on Cardiac Imaging

Composition of Group That Authored the Guideline

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Financial Disclosures/Conflicts of Interest

Not stated

Guideline Status

This is the current release of the guideline.

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Guideline Availability

Electronic copies: Available from the American College of Radiology (ACR) Web site [   ].

Print copies: Available from the American College of Radiology, 1891 Preston White Drive, Reston, VA 20191. Telephone: (703) 648-8900

Availability of Companion Documents

The following are available:

- ACR Appropriateness Criteria®. Overview. Reston (VA): American College of Radiology; 2 p. Electronic copies: Available in Portable Document Format (PDF) from the American College of Radiology (ACR) Web site [   ].
- ACR Appropriateness Criteria®. Literature search process. Reston (VA): American College of Radiology; 1 p. Electronic copies: Available in Portable Document Format (PDF) from the ACR Web site [   ].
- ACR Appropriateness Criteria®. Evidence table development – diagnostic studies. Reston (VA): American College of Radiology; 2013 Nov. 3 p. Electronic copies: Available in PDF from the ACR Web site [   ].
- ACR Appropriateness Criteria®. Radiation dose assessment introduction. Reston (VA): American College of Radiology; 2 p. Electronic copies: Available in Portable Document Format (PDF) from the ACR Web site [   ].
- ACR Appropriateness Criteria®. Manual on contrast media. Reston (VA): American College of Radiology; 92 p. Electronic copies: Available in PDF from the ACR Web site [   ].
- ACR Appropriateness Criteria®. Procedure information. Reston (VA): American College of Radiology; 1 p. Electronic copies: Available in PDF from the ACR Web site [   ].
- ACR Appropriateness Criteria® chronic chest pain-low to intermediate probability of coronary artery disease. Evidence table. Reston (VA): American College of Radiology; 12 p. Electronic copies: Available from the ACR Web site [   ].

Patient Resources

None available

NGC Status

This summary was completed by ECRI on February 20, 2001. The information was verified by the guideline developer on March 14, 2001. This summary was updated by ECRI Institute on June 15, 2008. This summary was updated by ECRI Institute on January 13, 2011 following the U.S. Food and Drug Administration (FDA) advisory on gadolinium-based contrast agents. This NGC summary was updated by ECRI Institute on September 10, 2012. This summary was updated by ECRI Institute on December 16, 2013 following the U.S. Food and Drug Advisory (FDA) notice on Lexiscan (regadenoson) and Adenoscan (adenosine).

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